

ROCKET ENGINE POWER BALANCE  
AND OPTIMIZATION CODE USER'S MANUAL



CONTRACT NO. NAS8-34642

FINAL REPORT

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## INTRODUCTION

The Rocketdyne Engine Balance and Optimization Program has been provided to NASA-MSFC and the purpose of this contract was to provide a user's manual containing a program description and instructions for its use and modification.



## USER'S MANUAL DESCRIPTION

A user's manual was written which includes the following information.

### INTRODUCTION AND SUMMARY

This section covers the overall program methodology, structure, and propellant and cycle options. The philosophy and approach to a rocket engine power balance are illustrated and the engine optimization process is explained.

### USER INSTRUCTIONS

Use of the program is described, including the mechanics of setting up JCL to compile, map, and execute the program, and data input to select the desired configuration. The selection of input options is summarized in this section, for reference, with more complete descriptions in the Common-Block Description section. Inputs associated with commonly-used configurations are emphasized.

Program limitations based on ranges of built-in data or component modeling methods are discussed in this section, along with output interpretation to indicate values which should be inspected to determine if alternate inputs would provide more favorable results or if the program did not reach a successful conclusion.

### SAMPLE RUN

A typical run of the program is presented with an explanation of the input variables selected and the setup of JCL and data for the run. The output values are described with interpretation of results.



## CODE STRUCTURE

Flow charts are provided showing interactions among the subprograms and the overall process by which the program performs balance and optimization calculations. The purpose of each subroutine call is indicated and iteration loops are described to show the variables being converged. This section also includes a description of which subroutines include propellant-and-cycle-dependent coding which may require modification to add new options to the program.

## SUBROUTINE DESCRIPTIONS

Each subroutine and function subprogram is described to indicate its functions, input/output variables, and methodology. Those routines which involve the engine configuration are described in detail so that modifications can be effected with minimum effort. Utility routines are described in sufficient detail to allow their use in additional applications.

## COMMON BLOCK DESCRIPTION

All of the input and most of the output variables are contained in a common block which is listed in this section, along with default values for the input variables and an indication of which subprograms use or calculate each variable. The format and units of input variables specified and the significance of key options is described.

## DIAGNOSTIC MESSAGES

Several routines provide diagnostic messages if numerical problems are encountered or if input values result in unreasonable calculated values. Most diagnostics are associated with optimization constraints, since initial guesses on optimizer independent variables are required which do not violate any of the implicit constraints. A description of these messages, along with suggested remedies, is provided. The source of error messages is identified and program limitations associated with the errors are described.